WATER WALLS

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Parsons the New School for Design
Green Fund 2012

CONTENTS

WATER WALLS

less than **2.8%** of the Earth's Water is Available for Human Use

80% of the Fresh Water consumed is for NON-POTABLE purposes

Clean water is intimately connected with human health but most of the Earth's water is in the world's oceans and not available for human use. The majority of the remaining fresh water is trapped in the polar ice caps, icebergs, and glaciers. Worldwide demand for water continues to grow as booming populations, agriculture and industry compete for this finite resource.

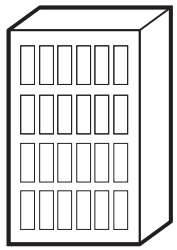
FRESH WATER IS FINITE

WATER WALLS

Architecture can help! Water Walls seeks to research and develop **low-cost** solutions that can be integrated into new or existing urban structures to allow for rainwater collection and treatment for use in fixtures and landscapes, reducing the overall use of potable water.

THE BRIEF
WATER WALLS

TREATMENT PLANT



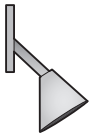
NYC BUILDING

FRESHWATER

FRESHWATER

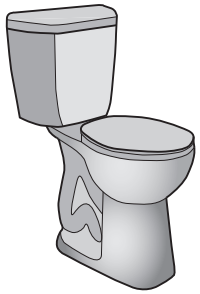
FRESHWATER

STORMWATER



SHOWERS

SINKS



TOILETS

GREYWATER

GREYWATER

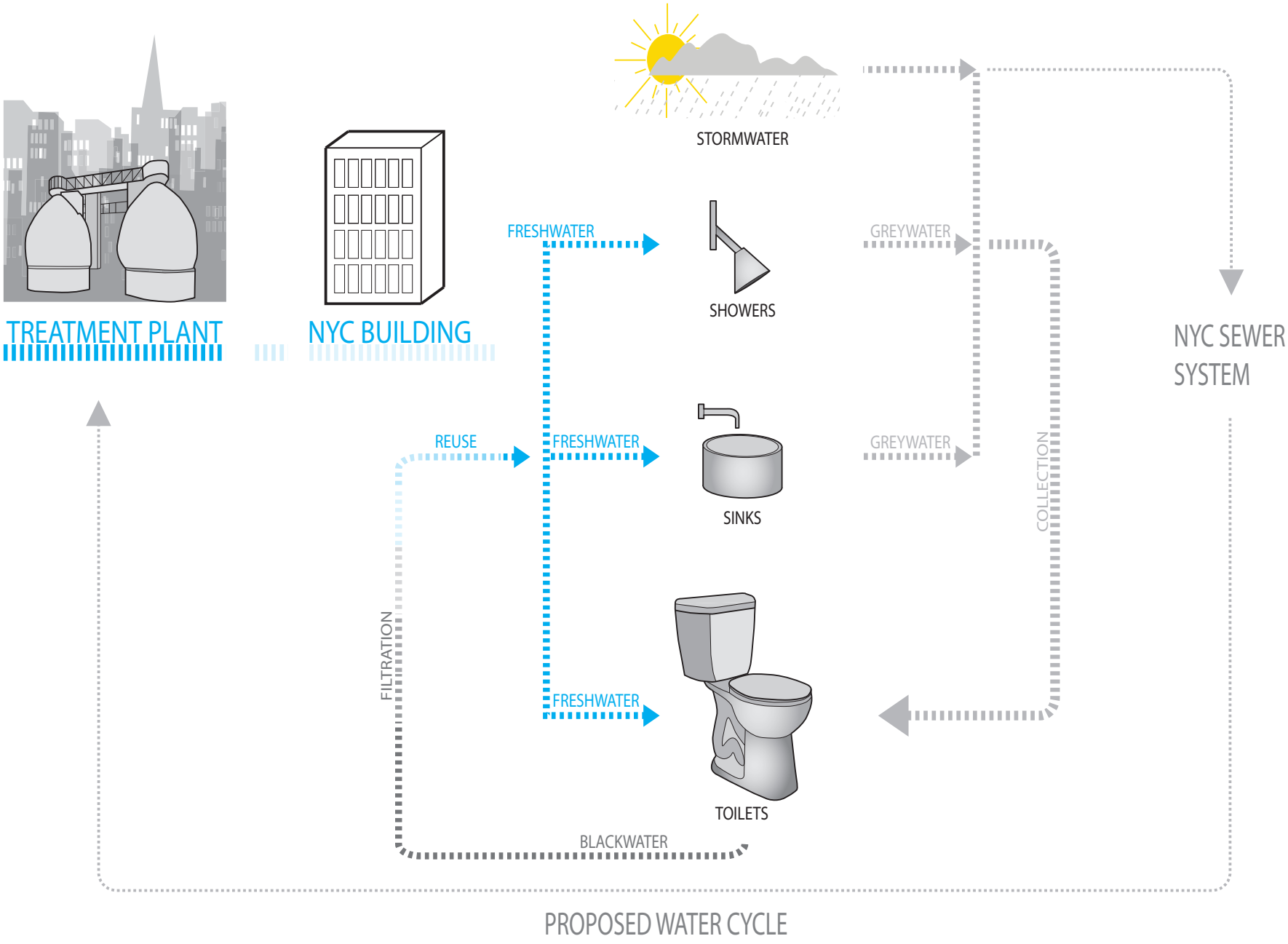
GREYWATER

NYC SEWER SYSTEM

CURRENT WATER CYCLE

THE BRIEF

WATER WALLS



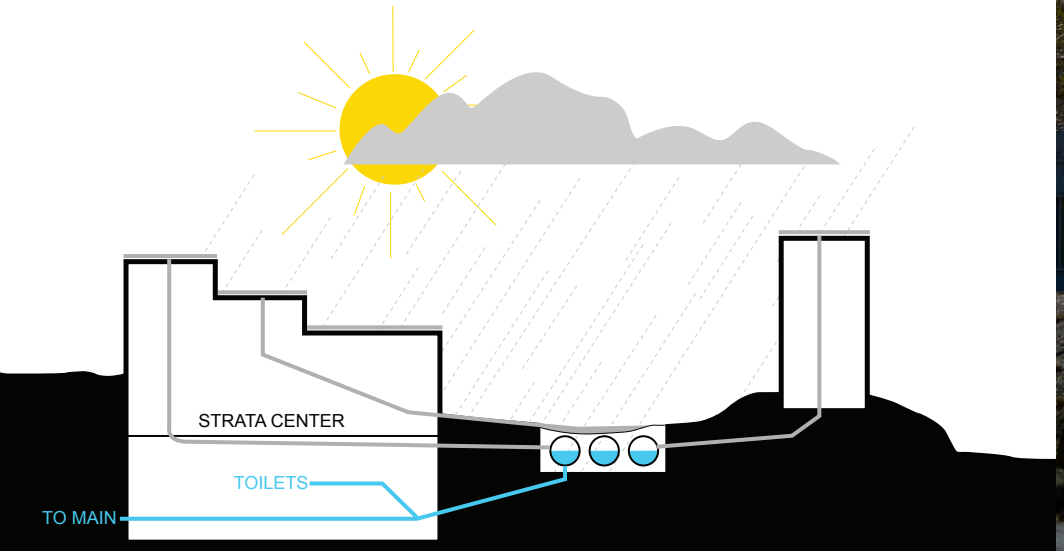
THE BRIEF

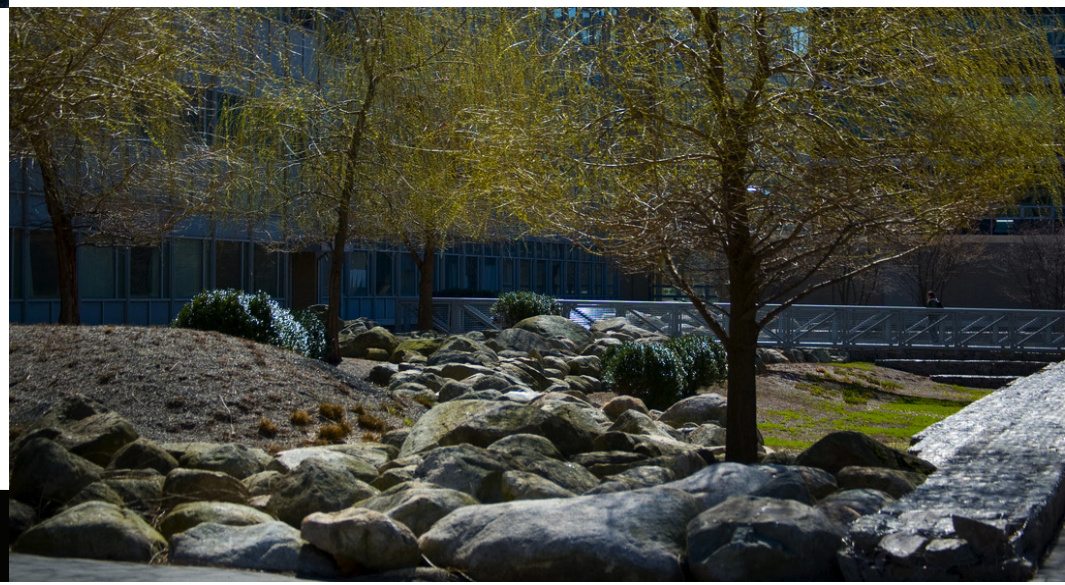
WATER WALLS

REDUCES water entering Combined Sewer Overflows (CSOs) via BIOFILTRATION SWALES

SLOWS RUNOFF water by containing and slowly discharging rainwater to the municipal system

COLLECTS and REUSES rainwater for flushing purposes within the building

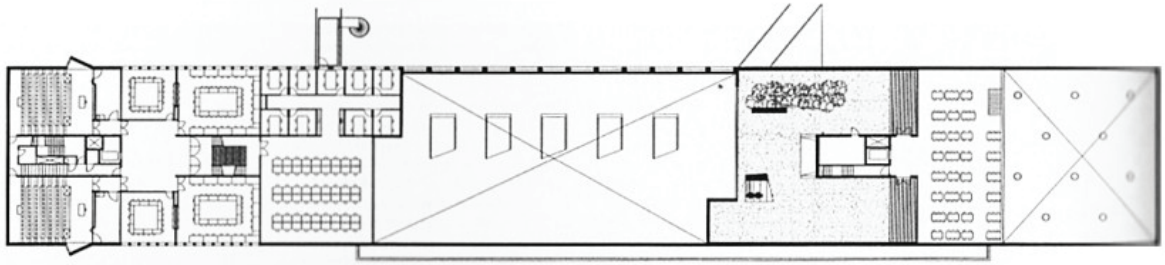


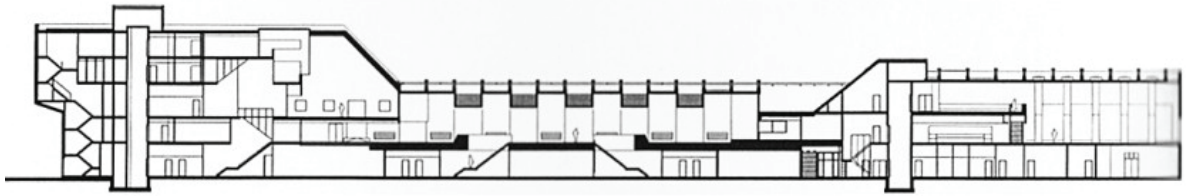


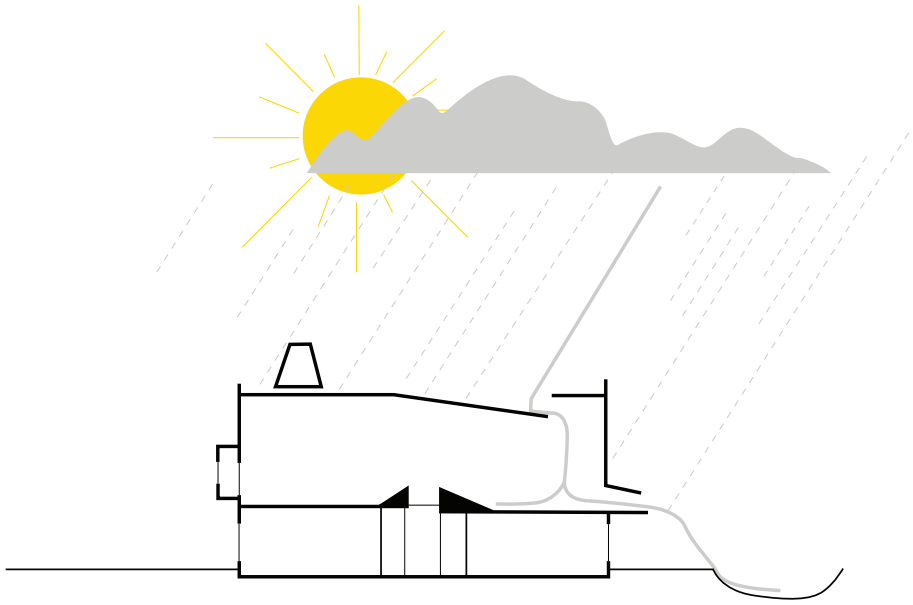
PROJECT: Stata Center at MIT
LOCATION: Cambridge, MA
COMPLETION: 2004
ARCHITECT: Frank Gehry
SCALE: 720,000 sf

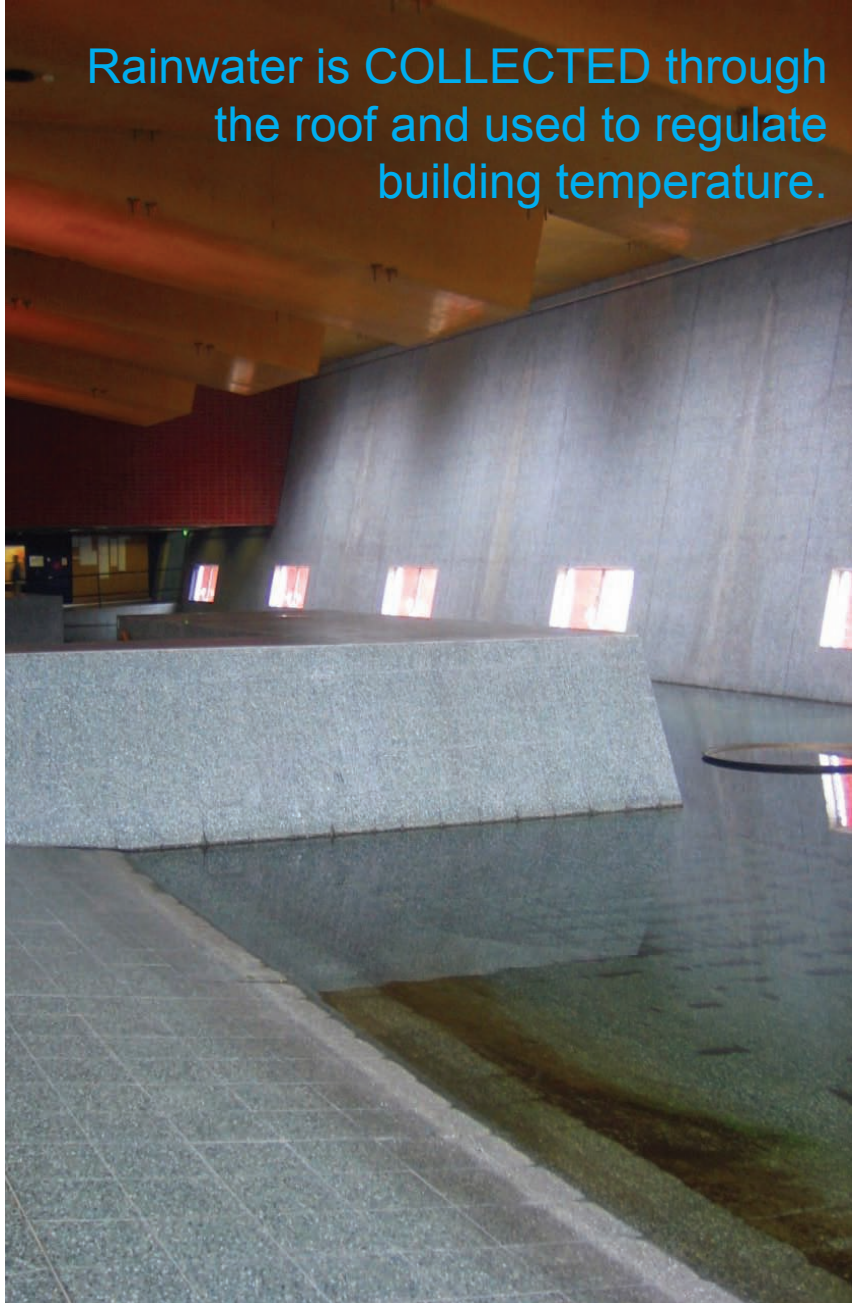
PRECEDENTS

WATER WALLS









PROJECT: Minnaert Building at University of Utrecht
LOCATION: Utrecht, Holland
COMPLETION: 1997
ARCHITECT: Neutelings Riedijk Architecten

PRECEDENTS

WATER WALLS

PROJECT: The Solaire
LOCATION: Battery Park City, NYC
COMPLETION: 2003
ARCHITECT: Cesar Pelli & Associates
SCALE: 357,000 sf; 293 Unit Apartment High-rise; 100 residents

PRECEDENTS

WATER WALLS

ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
18,600	7	Zone: C6-4 FAR: 10.0	4.81 in. 668,311 gal.	X	640,177 gal.	549,035 gal.	91,141.25 gal.

NAME: Sheila Johnson Center
ADDRESS: 2 West 13th Street
PROGRAM: Academic

ASSESSMENT OF NEW SCHOOL BUILDINGS

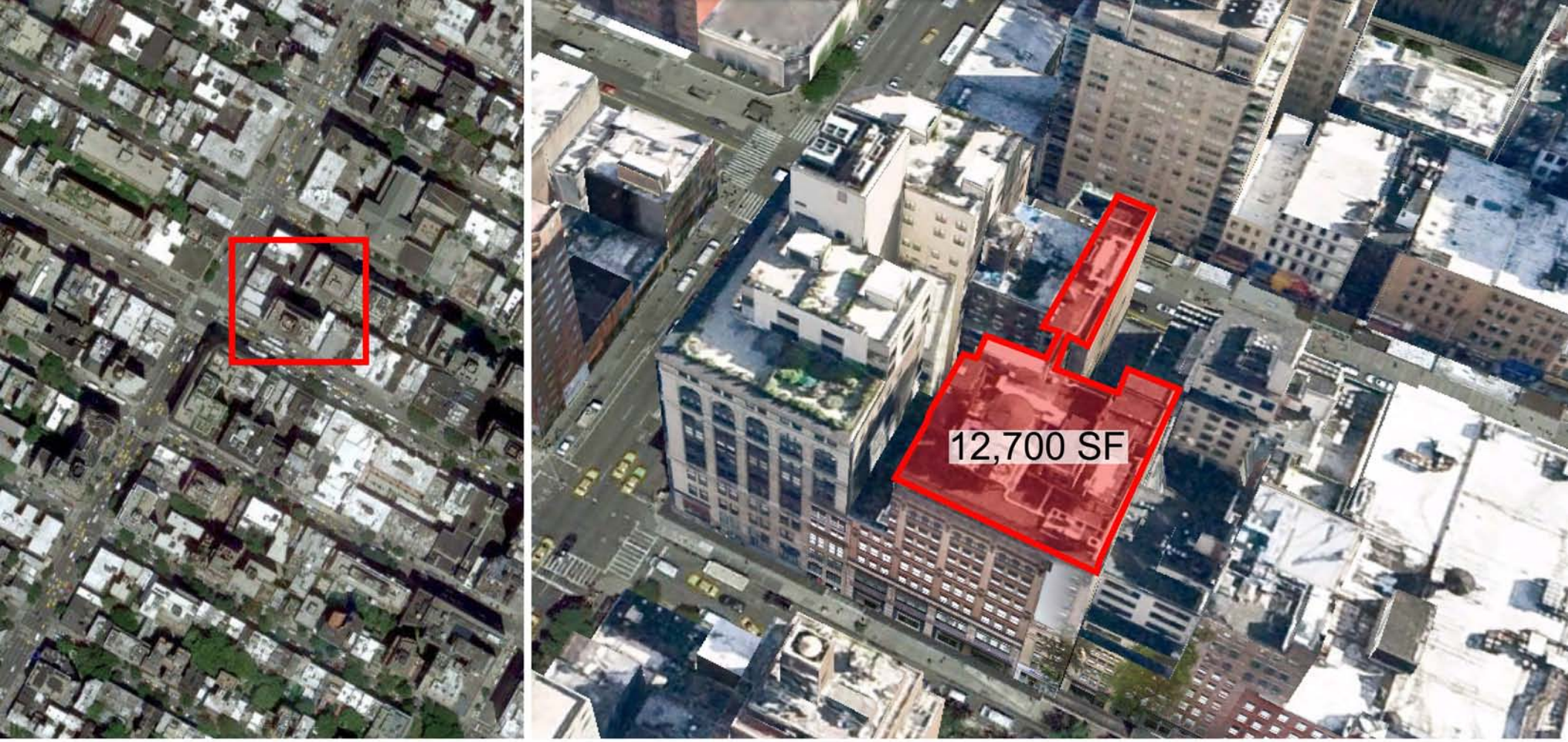
WATER WALLS

ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
16,000	5	Zone: C6-1 FAR: 6.5	4.81 in. 574,891 gal.	8,000	81,660 gal.	65,379 gal.	16,281 gal.

NAME: Parsons East
ADDRESS: 25 East 13th Street
PROGRAM: Academic

ASSESSMENT OF NEW SCHOOL BUILDINGS

WATER WALLS

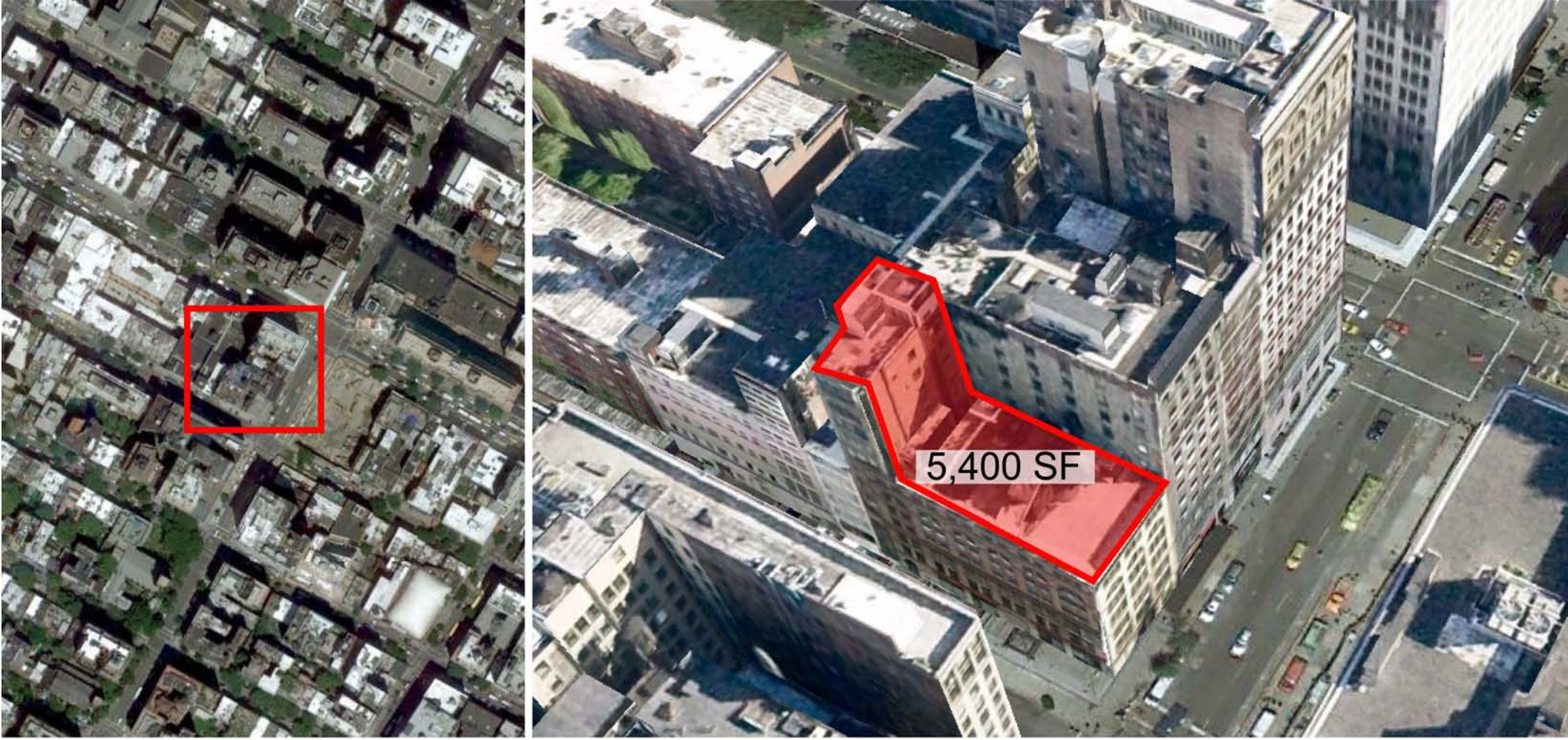


ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
12,700	8	Zone: C6-2 FAR: 6.5	4.81 in. 456,320 gal.	X	20,507 gal.	159,050 gal.	48,185 gal.

NAME: Arnold Hall
ADDRESS: 55 West 13th Street
PROGRAM: Academic

ASSESSMENT OF NEW SCHOOL BUILDINGS

WATER WALLS



ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
5,400	7	Zone: C6-4 FAR: 10.0	4.81 in. 194,026 gal.	X	20,507 gal.	16,189 gal.	4,317 gal.

NAME: Fanton Hall
ADDRESS: 72 Fifth Avenue
PROGRAM: Academic

ASSESSMENT OF NEW SCHOOL BUILDINGS

WATER WALLS

ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
18,000	16	Zone: C6-4M FAR: 10.0	4.81 in. 646,753 gal.	X	42,719 gal.	10,191 gal.	32,528 gal.

NAME: 79 Fifth Avenue
ADDRESS: 79 Fifth Avenue
PROGRAM: Academic

ASSESSMENT OF NEW SCHOOL BUILDINGS

WATER WALLS

ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
9,000	14	Zone: C6-4M FAR: 10.0	4.81 in. 323,376 gal.	X	22,162 gal.	17,342 gal.	4,819 gal.

NAME: 80 Fifth Avenue
ADDRESS: 80 Fifth Avenue
PROGRAM: Academic

ASSESSMENT OF NEW SCHOOL BUILDINGS

WATER WALLS

ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
11,000	11	Zone: C6-4M FAR: 10.0	4.81 in. 395,238 gal.	X	30,926 gal.	24,926 gal.	6,717 gal.

NAME: Student Study Center
ADDRESS: 90 Fifth Avenue
PROGRAM: Academic

ASSESSMENT OF NEW SCHOOL BUILDINGS

WATER WALLS

ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
5,000	7	Zone: C2-6 FAR: 4.0	4.81 in. 179,654 gal.	X	123,467 gal.	19,200 gal.	104,267 gal.

NAME: 13th Street Residence Hall
ADDRESS: 118 West 13th Street
PROGRAM: Residence

ASSESSMENT OF NEW SCHOOL BUILDINGS

WATER WALLS

ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
6,000	4	Zone: C-1.6A FAR: 4.0	4.81 in. 215,584 gal.	X	12,717 gal.	9,956 gal.	2,761 gal.

NAME: Drama Building
ADDRESS: 151 Bank Street
PROGRAM: Academic

ASSESSMENT OF NEW SCHOOL BUILDINGS

WATER WALLS

ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
9,500	11	Zone: R8A FAR: 6.02	4.81 in. 341,342 gal.	X	599,002 gal.	51,760 gal.	547,242 gal.

NAME: Stuyvesant Park Residence
ADDRESS: 318 East 15th Street
PROGRAM: Residence

ASSESSMENT OF NEW SCHOOL BUILDINGS

WATER WALLS

ROOF (sf)	STORIES	FAR	AVG MO. RAIN	OUTDOOR PLANTABLE AREA (sf)	AVG. MO. WATER CONSUMPTION	non POTABLE	POTABLE
10,000	6	Zone: R7B FAR: 7.0	4.81 in. 364,307 gal.	3,000	1,021,956 gal.	192,000 gal.	829,956 gal.

NAME: 20th Street Residence
ADDRESS: 300 West 20th Street
PROGRAM: Residence

ASSESSMENT OF NEW SCHOOL BUILDINGS

WATER WALLS

20th Street Residence
300 W 20th Street

DEMANDS	Square Feet	Water Use/day	Water Use/Month
Irrigation*	3000	267 gpd	8010
Washdown**	1032	3000 gpd	91250
Potable			69163
Non-Potable			16000
			184423

SUPPLY	Gallons/Month	60% Adjustment	Demand Met
Rainwater	364307	218584	
Faucets	9163	5497	
Showers	60000	36000	
Non-Potable	433470	**260082**	**225.65 %**
Total Water			**141.02 %**

*Estimate 1/2 sf of roof is plantable; Irrigation = 1inch/week = 623 gal/sf
** Ground level sidewalk: 150gpm at 20 minutes/day = 3000gpd

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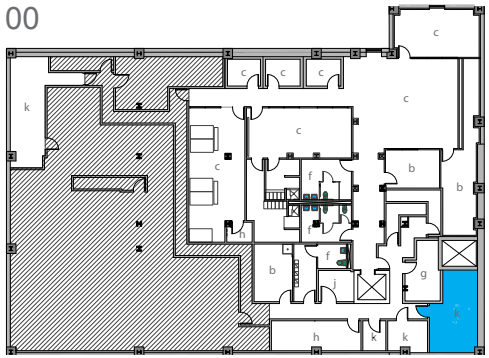

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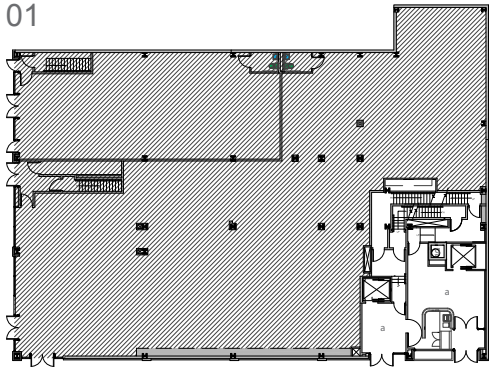


03 - 07

02

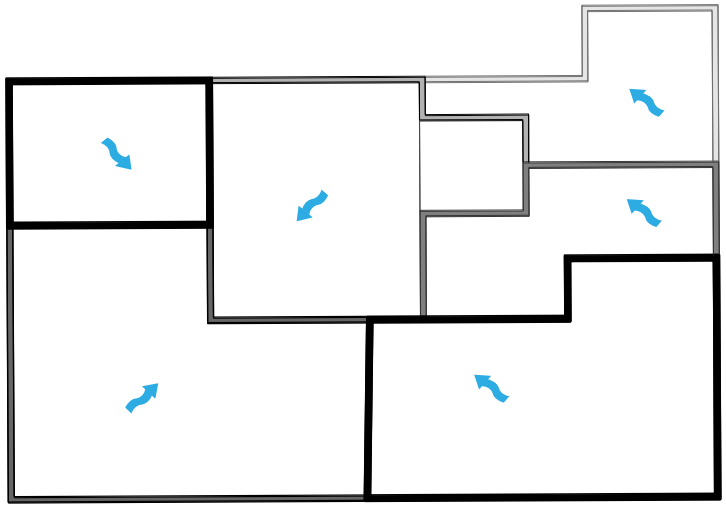
Potable Use | Potable + Non-Potable Use // a. Lobby b. Office c. Lounge d. Kitchenette e. Bedroom f. Bathroom g. Custodial Closet h. Storage i. Laundry j. Janitor k. Mechanical l. Outdoor Patio

Building Type:	New School Residential Building
Year Built:	2004
Occupancy:	200
Potable Water Use:	829,956 gallons/month
Non-Potable Water Use:	192,000 gallons/month
Rain Catchement Potential:	364,307 gallons/month (100%)

DETAILED SURVEYS - WATER USE

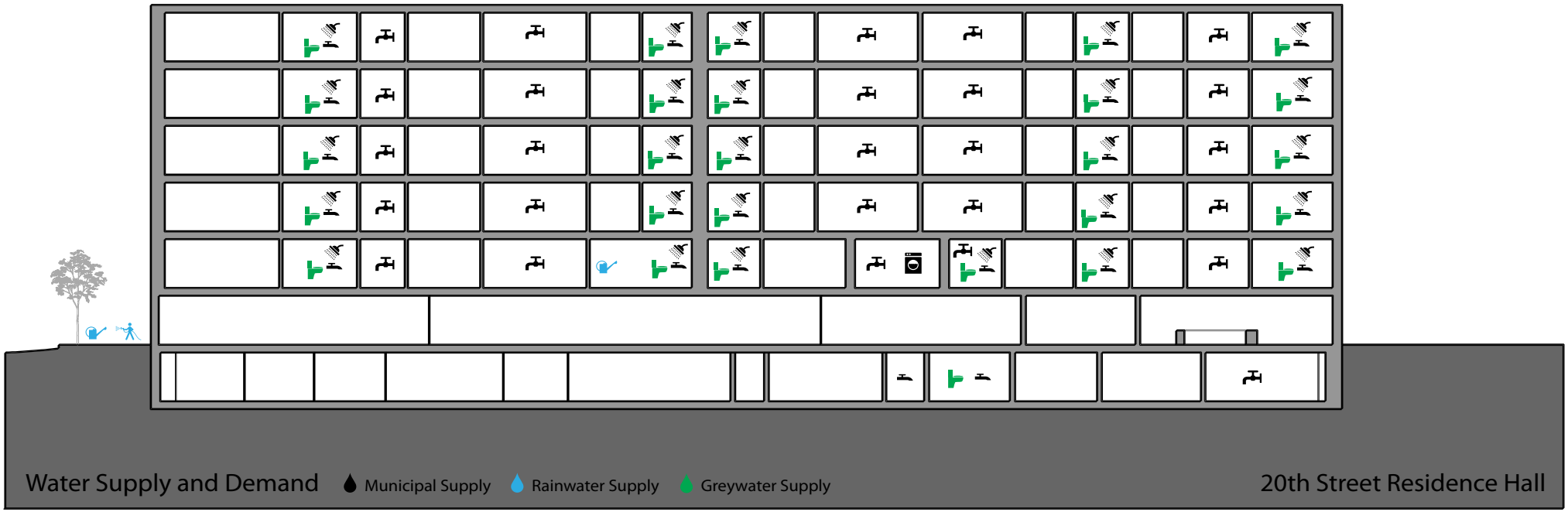
WATER WALLS

Roof Drainage for Possible COLLECTION points



Estimation: limited roof access prevented full assessment of roof water flow

Possible Sites of RAINWATER & GREYWATER REUSE



Building Type:	New School Residential Building
Year Built:	2004
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Potable Water Use:	829,956 gallons/month
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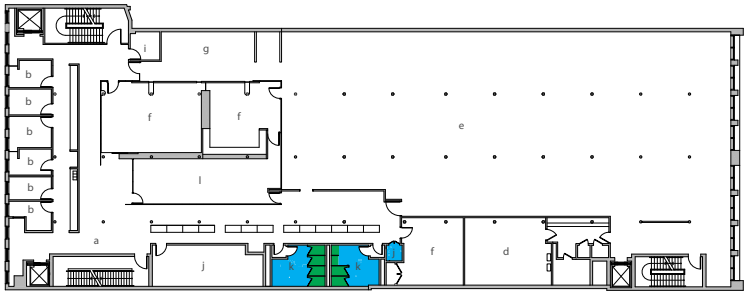
DETAILED SURVEYS - WATER USE

WATER WALLS

Parsons East
25 E 13th Street


05


04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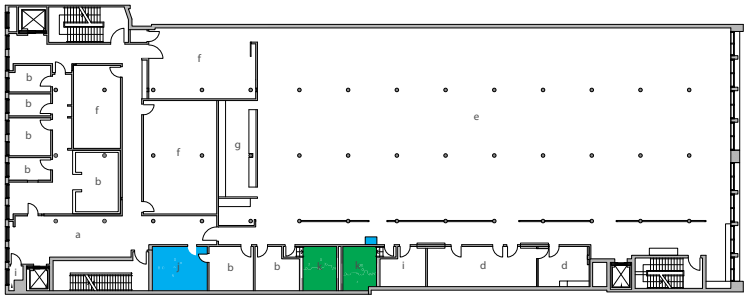

02

DEMANDS	Square Feet	Water Use/day	Water Use/Month
Irrigation*	8000	712 gpd	21360
Washdown**	1032	3000 gpd	91250
Potable			16281
Non-Potable			65379
			194270

SUPPLY	Gallons/Month	60% Adjustment	Demand Met
Rainwater	574891	344934	
Faucets	16281	9768	
Non-Potable	591172	**354703**	**199.28 %**
Total Water			**182.58 %**

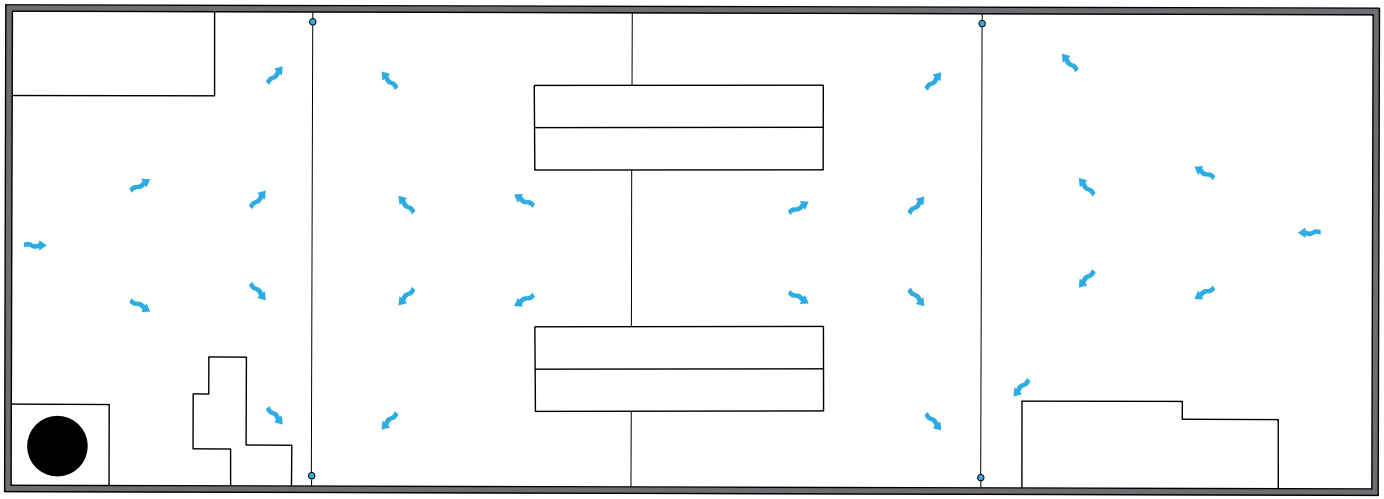
*Estimate 1/2 sf of roof is plantable; Irrigation = 1inch/week = 623 gal/sf
** Ground level sidewalk: 150gpm at 20 minutes/day = 3000gpd

Potable Use | Potable + Non-Potable Use // a. Lobby b. Office c. Lounge d. Lab/Workshop e. Open Studio f. Classroom g. Computer Lab h. Individual Studio i. Storage j. Janitor/Maintenance k. Toilet l. Gallery

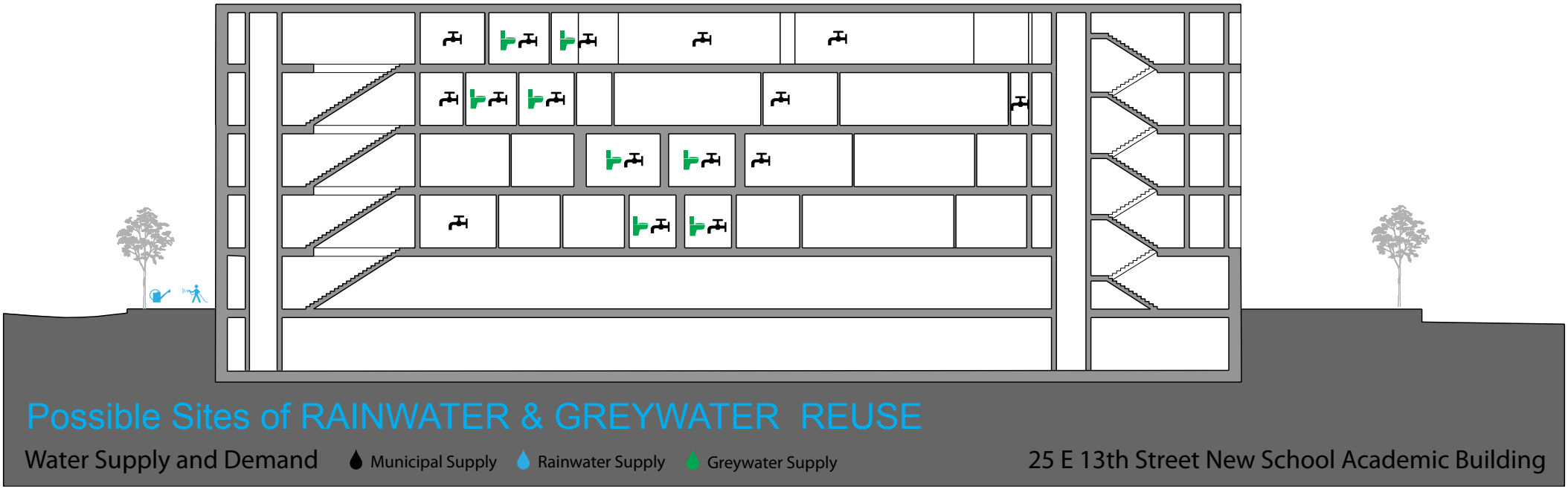
Building Type:	Academic Building
Year Built:	1929 - Landmarked
Occupancy:	Appx. 1340
Potable Water Use:	65,379 gallons/month
Non-Potable Water Use:	16,281 gallons/month
Rain Catchement Potential:	574,891 gallons/month (100%)

DETAILED SURVEYS - WATER USE

WATER WALLS



Roof Drainage for Possible COLLECTION points



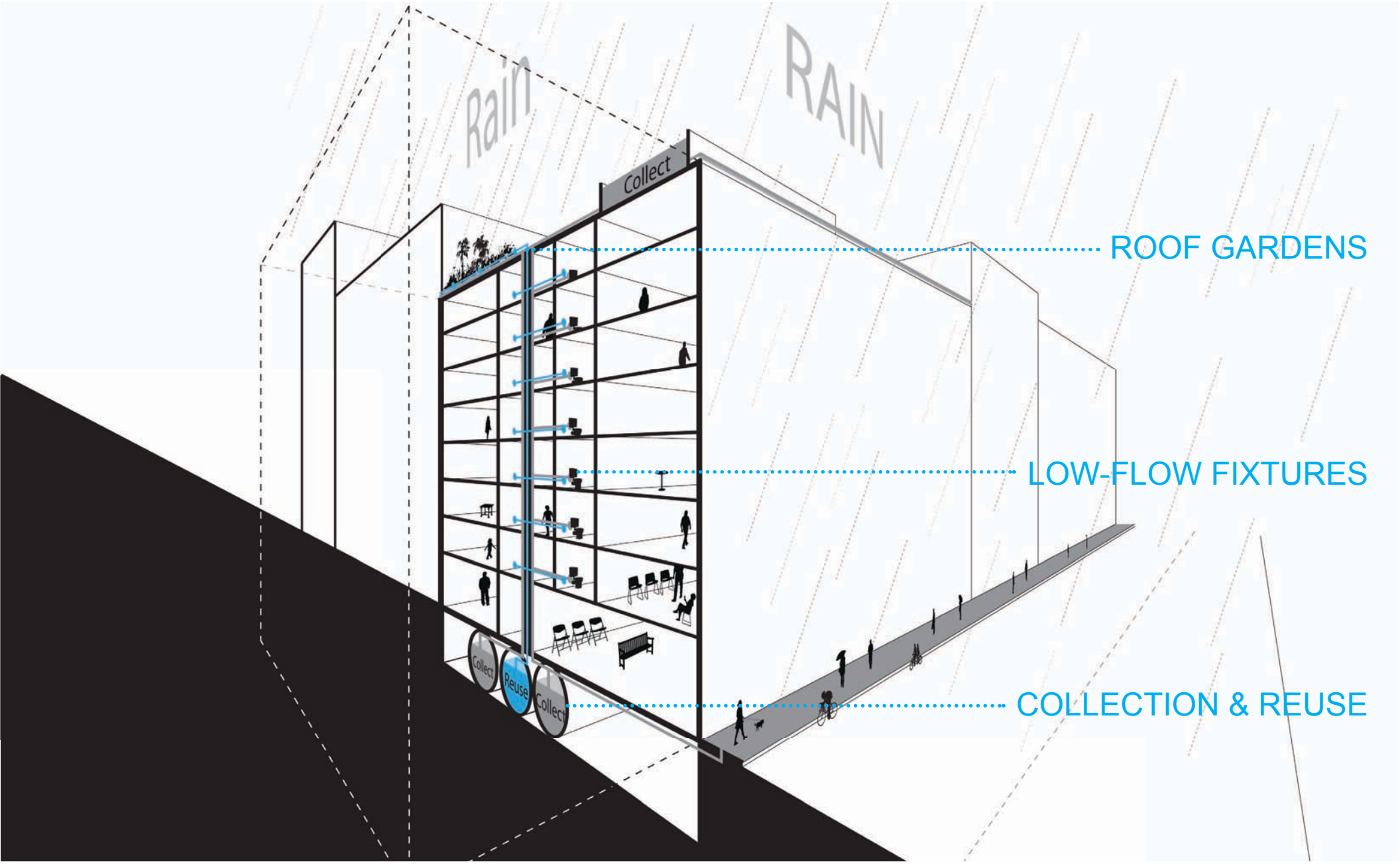
Possible Sites of RAINWATER & GREYWATER REUSE

Water Supply and Demand Municipal Supply Rainwater Supply Greywater Supply

25 E 13th Street New School Academic Building

DETAILED SURVEYS - WATER USE

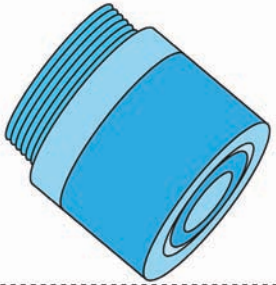
WATER WALLS



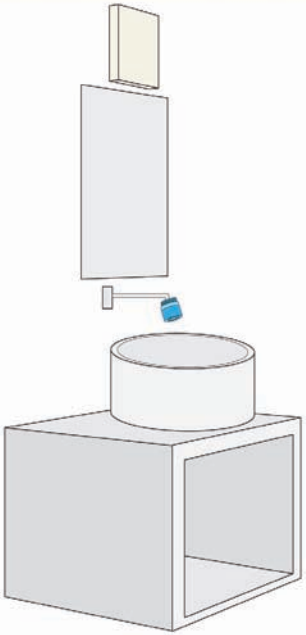
Three solutions, each varying in degree of long-term commitment and ease of installation, were investigated and tested for feasibility within the two New School building case studies we have developed. The ultimate goal is to provide both cost and environmental savings to the University while demonstrating a commitment to the goals of sustainable design.

THREE SOLUTIONS

WATER WALLS



Dual-Thread Needle Spray
Aerator 1.0 GPM
MODEL # N3210N-PC



Easy Installment

Niagara's faucet aerators save money on water and energy by producing forceful streams at a reduced flow rate that minimizes the amount of energy needed to heat hot water.

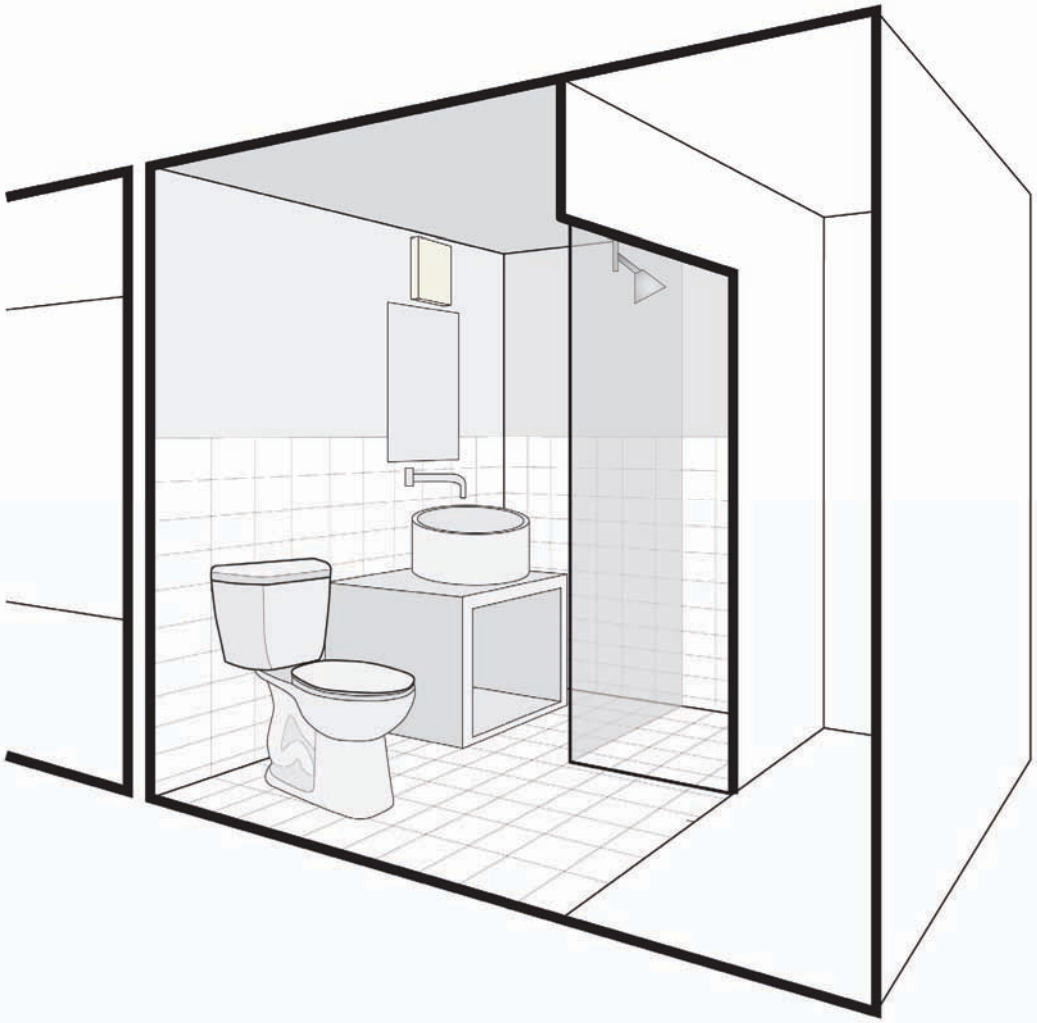
Dual-thread aerator to fi t both male and female faucets. Solid brass construction with chrome finish Includes all parts necessary for proper installation and operation. Works well in both kitchens and baths

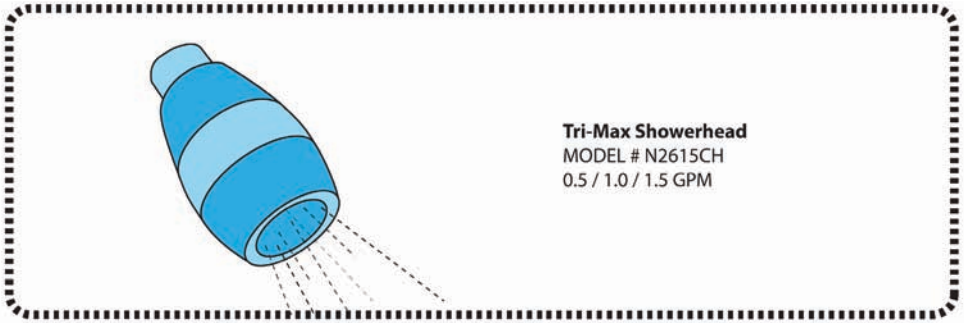
FAUCET AERATOR

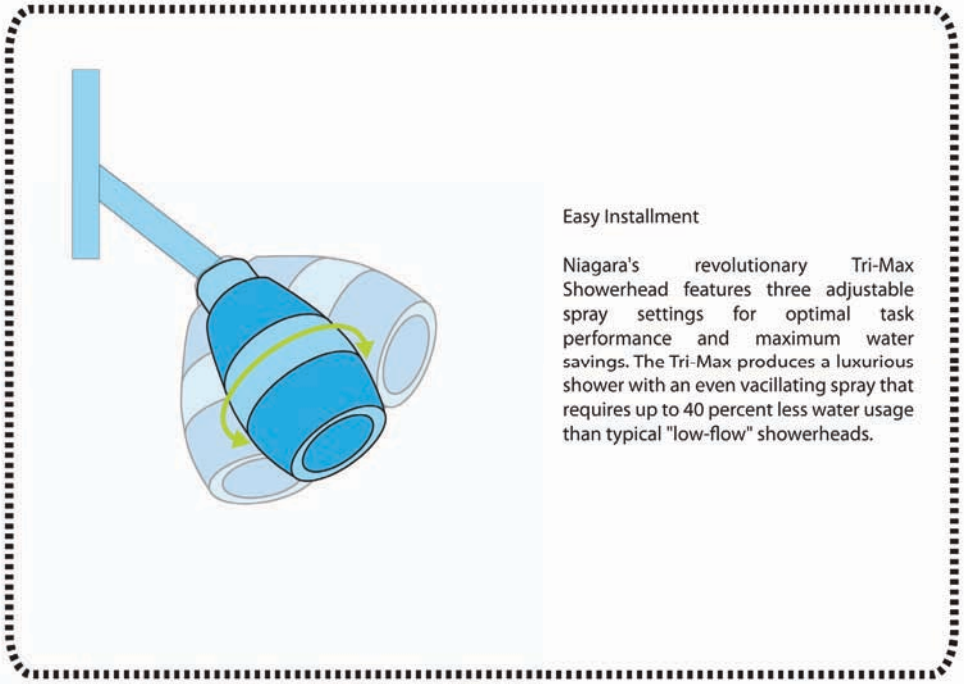
Niagara's patented non-removable Pressure Compensated Dual-Thread Needle Spray Bathroom aerators are an innovative water-saving solution designed to accommodate both male and female applications. Niagara's faucet aerators save money on water and energy by producing forceful streams at a reduced flow rate that minimizes the amount of energy needed to heat hot water. Dual-thread aerator to fit both male and female faucets

SOLUTION A - LOW-FLOW FIXTURES

WATER WALLS





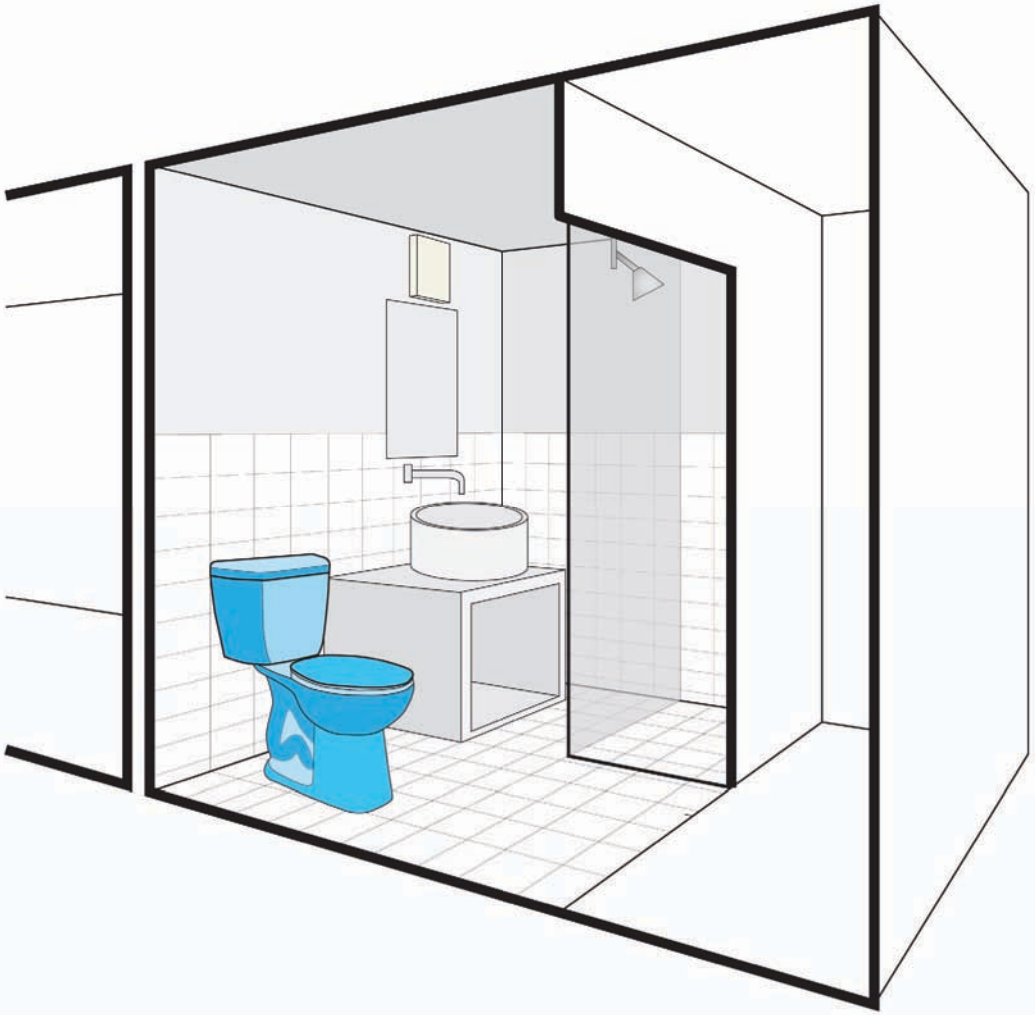


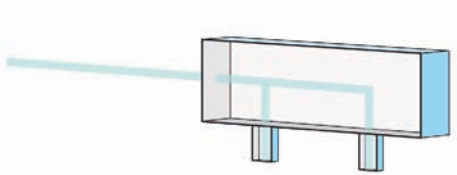
LOW-FLOW SHOWERHEADS

The Tri-Max Showerhead features three adjustable spray settings for optimal task performance and maximum water savings, using up to 40 percent less water usage than typical "low-flow" showerheads. Simply twist the showerhead to match your desired task: 0.5 GPM flow rate for soaping, 1.0 GPM for showering, and 1.5 GPM for a powerful rinse mode.

SOLUTION A - LOW-FLOW FIXTURES

WATER WALLS





Toilet Fill Cycle Diverter
MODEL # N3164-I
$8.99
saves 1/2 gallon per flush

Easy Installment

Low Cost:
$8.99(6) + $25/ 1 hour
labor = $78.94
Payback time = 45 days
with annual water savings up to
$684.71 and 63,145 gallons H20

FILL CYCLE DIVERTER

Niagara's Toilet Fill Cycle Diverter is an easy-to-install, inexpensive water saving product for your toilet tank that saves up to 50% of the fill cycle water - up to 1/2 gallon per flush. The diverter works by redirecting a majority of the water that would normally drain down the overflow tube back into your toilet tank during the fill cycle.

CURRENT FIXTURE	WATER USAGE (GPM)	# of FIXTURES	# of PERSONS	USE/ PERSON/ DAY	MINUTES / USE	WATER USE/ DAY (gallons)	WATER USE/ YEAR (gallons)	WATER & SEWAGE COST/ GALLON	YEARLY WATER COST ($)
Lavatory Sinks	2	19	1340	3	0.1666	1339.464	292003.152	$0.01021	$2,981.35
American Standard Water Closet	3.5	6	335	3		3517.5	766815	$0.01021	$7,829.18
					TOTAL	4856.964	1058818.152		$10,810.53
WATER SAVING PRODUCT									
Dual Thread Needle Spray Aerator Model N3210N-PC	1	19	1340	3	0.1666	669.732	146001.576	$0.01021	$1,490.68
Niagara Conservation Flush Divertor Model N3164-1	3	6	335	3		3015	657270	$0.01021	$6,710.73
					TOTAL	3684.732	803271.576		$8,201.40

PAYBACK TIME	SAVINGS	COST OF FIXTURE	# of FIXTURES	TOTAL FIXTURE COST	INSTALL (1 hours)	UPFRONT COST	SAVINGS AFTER 1 YEAR	SAVINGS AFTER 2 YEARS
Dual Thread Needle Spray Aerator Model N3210N-PC	$1,490.68	$2.00	19	$38.00	$25.00	$63.00	$1,427.68	$2,918.35
Flush Divertor Model N3164-1	$1,118.45	$8.99	6	$53.94	$25.00	$78.94	$1,039.51	$2,157.97
						TOTAL SAVINGS	$2,467.19	$5,076.32

NOTES:

All Products from Niagara Conservation

Only fixtures that are able to receive water saving Products are calculated (for instance, art sinks are not included because of differing water pressure demands)

Water Closet Usage calculated by dividing number of occupants by 4 floors as the only non-tankless toilets are located on the 3rd floor

218 days used as year length rather than 365 to account for lower Summer occupany

COST FEASIBILITY : 25 East 13th Street

Over two years, the University could over $5,000 and over 500,000 gallons of water in this building alone!

SOLUTION A - LOW-FLOW FIXTURES

WATER WALLS

CURRENT FIXTURE	WATER USAGE (GPM)	# of FIXTURES	# of PERSONS	USE/ PERSON/ DAY	MINUTES / USE	WATER USE/ DAY (gallons)	WATER USE / YEAR (gallons)	WATER & SEWAGE COST/ GALLON	YEARLY WATER COST ($)
Delta Lavatory Faucets Model 520 MPU	2	57	200	5	0.1666	333.2	121618	$0.01021	$1,241.72
Delta Kitchen Faucets Model 100	2	37	200	3	3	3600	1314000	$0.01021	$13,415.94
Delta Bath Mixing Valves Model 1343 CWS	2.5	49	200	1	10	5000	1825000	$0.01021	$18,633.25
U-R 4191 Atlas 1.6 Toilet	1.6	55	200	5		1600	584000	$0.01021	$5,962.64
					TOTAL	10533.2	3844618		$39,253.55
WATER SAVING PRODUCT									
Dual Thread Needle Spray Aerator Model N3210N-PC (LAVATORIES)	1	57	200	5	0.1666	166.6	60809	$0.01021	$620.86
Dual Thread Needle Spray Aerator Model N3210N-PC (KITCHENS)	1	37	200	3	3	1800	657000	$0.01021	$6,707.97
Tri-Max Showerhead Model N2615CH	1.5	49	200	1	10	3000	1095000	$0.01021	$11,179.95
Flush Divertor Model N3164-1	1.1	55	200	5		1100	401500	$0.01021	$4,099.32
					TOTAL	6066.6	2214309		$22,608.09

PAYBACK TIME	SAVINGS	COST OF FIXTURE	# OF FIXTURES	TOTAL FIXTURE COST	INSTALL (2 hours)	UPFRONT COST	SAVINGS AFTER 1 YEAR	SAVINGS AFTER 2 YEARS
Dual Thread Needle Spray Aerator Model N3210N-PC (LAVATORIES)	$620.86	$2.00	57	$114.00	$50.00	$164.00	$456.86	$1,077.72
Dual Thread Needle Spray Aerator Model N3210N-PC (KITCHENS)	$6,707.97	$2.00	37	$74.00	$50.00	$124.00	$6,583.97	$13,291.94
Tri-Max Showerhead Model N2615CH	$7,453.30	$19.95	49	$977.55	$50.00	$1,027.55	$6,425.75	$13,879.05
Flush Divertor Model N3164-1	$1,863.33	$8.99	55	$494.45	$50.00	$544.45	$1,318.88	$3,182.20
						TOTAL SAVINGS	$14,785.45	$31,430.91

COST FEASIBILITY : 300 West 20th Street

Over two years, the University could over $30,000 and over 1.6 million gallons of water!

SOLUTION A - LOW-FLOW FIXTURES

WATER WALLS

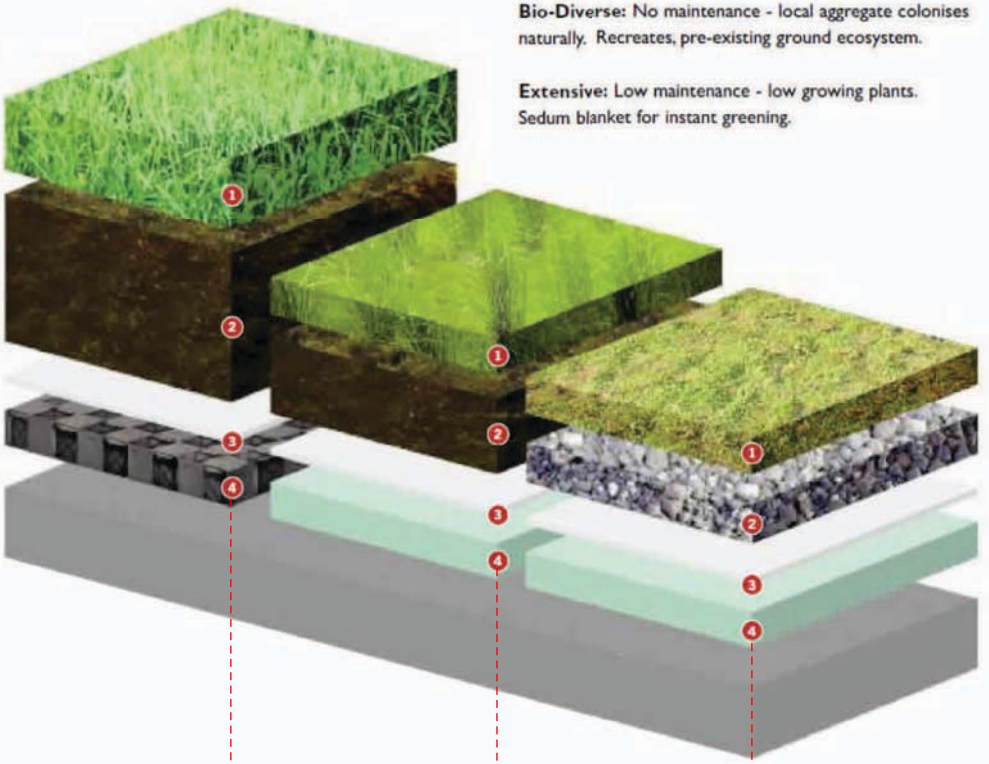
SKY-GARDEN SYSTEMS

Depending on your criteria and the limitations of the roof space there are 3 varieties of Sky-Garden:

Intensive: High maintenance - Replicates a ground level garden. Provides new amenity space.

Bio-Diverse: No maintenance - local aggregate colonises naturally. Recreates, pre-existing ground ecosystem.

Extensive: Low maintenance - low growing plants. Sedum blanket for instant greening.



INTENSIVE BUILD UP:
1) Planting, Paving, Decking
2) Intensive Soil
3) Filter Fleece
4) Geodrain

Depth and Wet Weight vary

BIO-DIVERSE BUILD UP:
1) Wildflower, aggregate
2) Bio-Diverse soil mix
3) Filter Fleece
4) Biodrain

Depth and Wet Weight vary

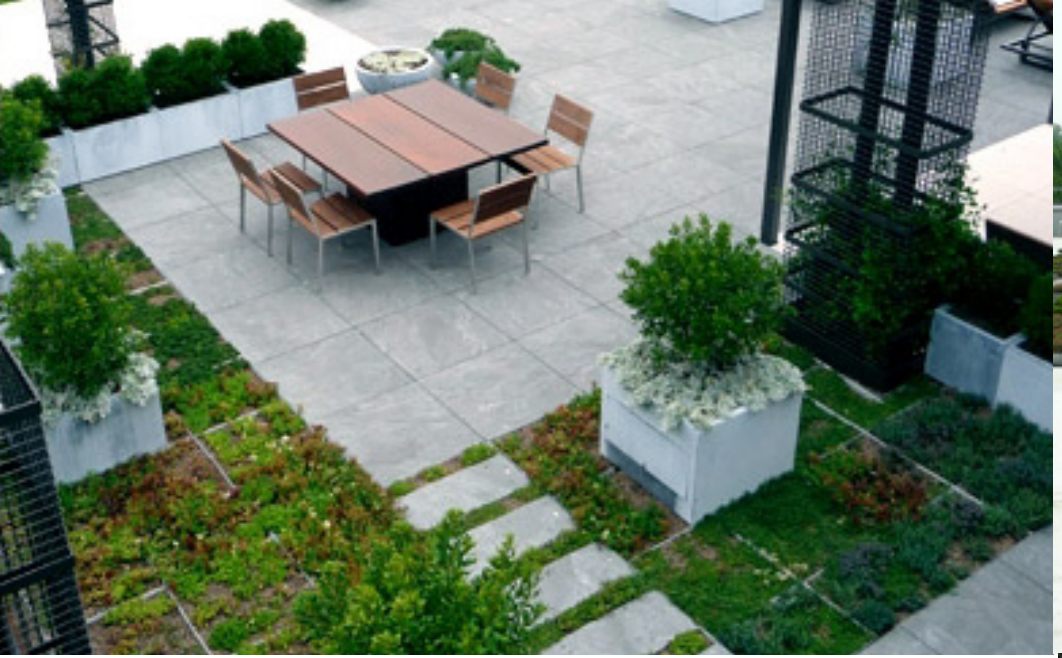
EXTENSIVE BUILD UP:
1) Sedum Blanket
2) Sedum Substrate
3) Filter Fleece
4) Biodrain

Depth 120mm
Wet Weight 110kg/m²

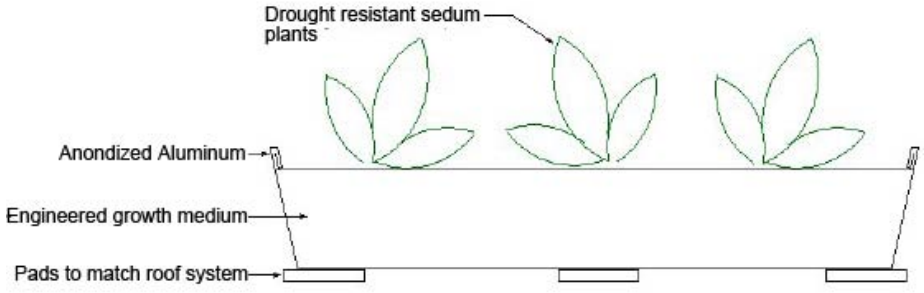
Providing roof vegetation reduces water runoff at the street level while also giving buildings significantly lower operating costs because of temperature redution.

SOLUTION B - ROOF GARDENS

WATER WALLS



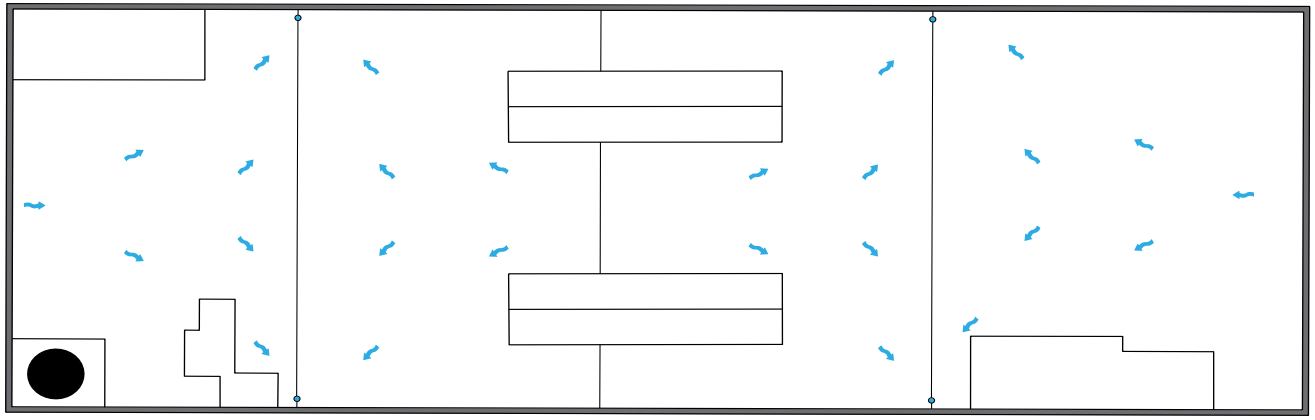
MODULAR SEDUM TRAYS



Many companies provide green roof systems that use modules of trays that interlock and form a cooling and aborptive living membrane on existing roofs. Pictured above are the green sedum modules produced by the company Green Roof Blocks.

SOLUTION B - ROOF GARDENS

WATER WALLS



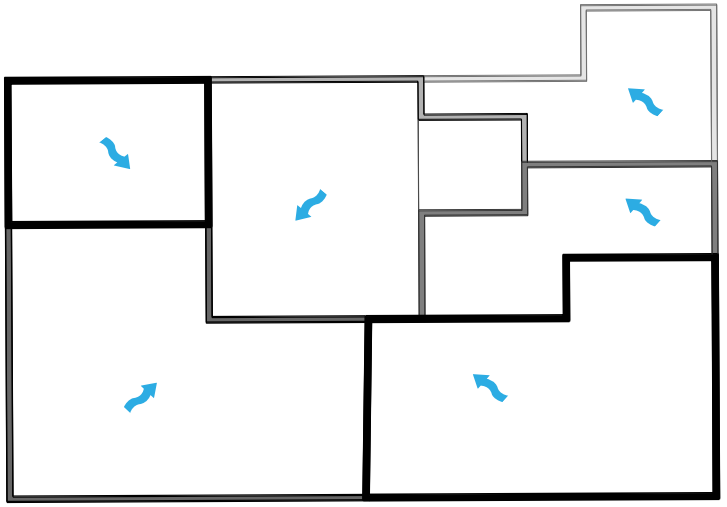
25 East 13th Street

% of Roof Covered	50%	25%	12.50%	6.25%
Square Footage Covered	8000	4000	2000	1000
# of Units	2000	1000	500	250
Total Unit Cost	$145,000.00	$75,000.00	$40,000.00	$20,625.00
Installation Cost	$24,000.00	$14,000.00	$9,000.00	$7,500.00
Shipping Cost	$7,000.00	$3,500.00	$1,750.00	$3,125.00
TOTAL COST	$176,000.00	$92,500.00	$50,750.00	$31,250.00
Retained Water (Gallons/sf/year)	6075	3038	1519	759
Total Water Retained in One Year	48,601,120	12,150,280	3,037,570	759,393
Energy Cost Savings, Older Building ($0.15/sf/yr)	$1,200.00	$600.00	$300.00	$150.00
PAYOFF TIME (years)	147	154	169	208
Water Retained During Payoff Time	7,128,164,267	1,873,168,167	513,855,592	158,206,771
Data based off 10 year storm values in NYC (6.7 in)				

An array of seedum trays could significantly reduce water runoff from the Parsons East Building. However, the economic expense will not be offset by energy savings for at least 146 years after installation. Before installing such a system, a monetary environmental expense must also be devised and assessed. In addition, roof loads would increase by a factor of an additional 17 lbs/sf. A structural engineer would need to be consulted to assess whether these additional loads are feasible.

SOLUTION B - ROOF GARDENS

WATER WALLS



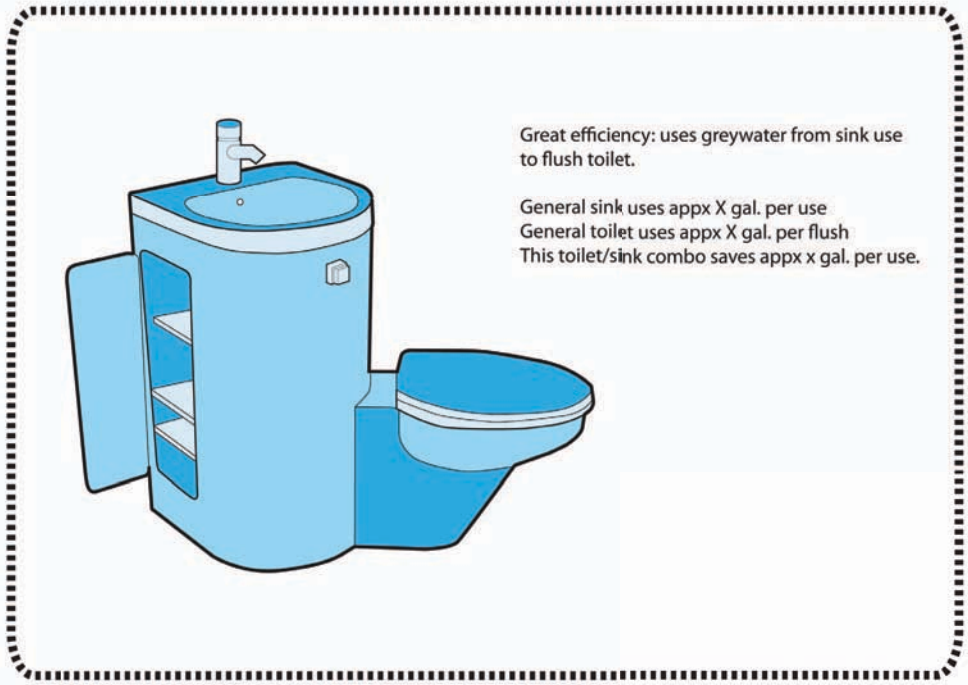
300 West 20th Street

% of Roof Covered	50%	25%	12.50%	6.25%
Square Footage Covered	5,000	2,500	1,250	625
# of Units	1,250	625	313	156
Total Unit Cost	$93,750.00	$50,000.00	$25,000.00	$12,890.63
Installation Cost	$17,500.00	$11,250.00	$5,625.00	$4,687.50
Shipping Cost	$4,375.00	$2,187.50	$3,906.25	$1,953.13
TOTAL COST	$115,625.00	$63,437.50	$34,531.25	$19,531.26
Retained Water (Gallons/sf/year)	3770	1898	949	475
Total Water Retained in One Year	18,849,810	4,746,203	1,186,551	296,638
Energy Cost Savings, Newer Building ($0.06/sf/yr)	$300.00	$150.00	$75.00	$37.50
PAYOFF TIME (years)	385	423	460	521
Water Retained During Payoff Time	7,265,030,938	2,007,248,141	546,307,741	154,498,875
Data based off 10 year storm values in NYC (6.7 in)				

Student residing at the 20th Street Residence have already begun to collect rainwater for gardens they have planted in the adjoining outdoor patio areas. In addition, seedum trays could replace the tiles on parts of the roof as well. Though significant reductions in water runoff may be achieved, the economic payoff time of this investment would be over 300 years.

SOLUTION B - ROOF GARDENS

WATER WALLS



Neo-Comby Toilet by Neo-Metro

While the idea of one fixture that directly captures sink water for non-potable re-use in the toilet is appealing, the reality is that this technology has not been streamlined enough to bring cost down to a level suitable for large University use. At over $5000 per unit, it would take almost 5 years for the intial costs to be offset by savings from the installation of just one of these devices. Water savings are also not drastically realized which makes it more difficult to justify the price tag.

SOLUTION C - COLLECTION & REUSE

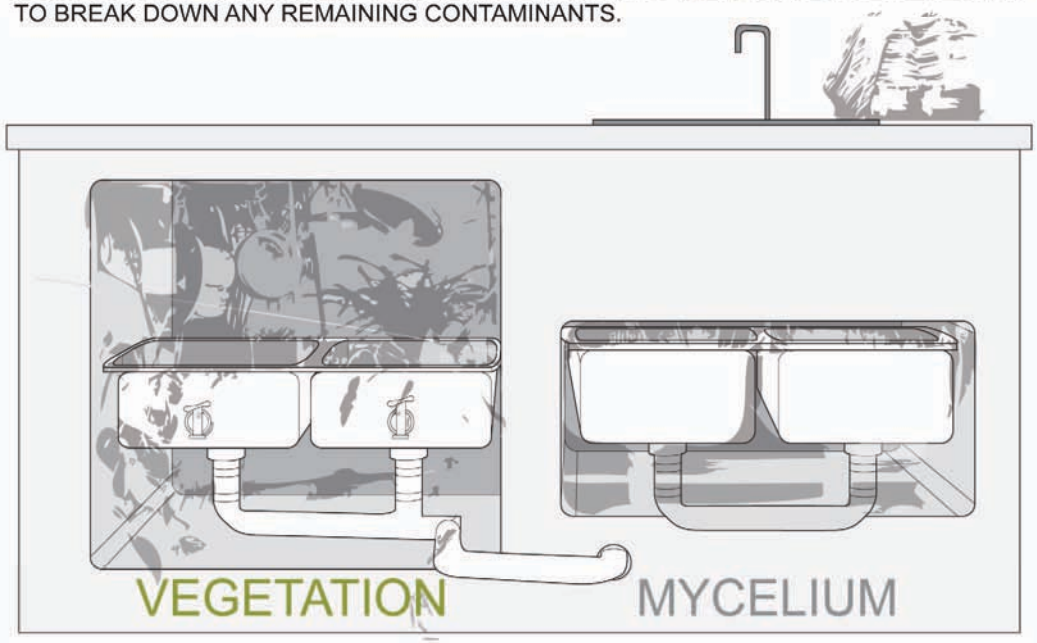
WATER WALLS

MYCELIUM MUSHROOMS

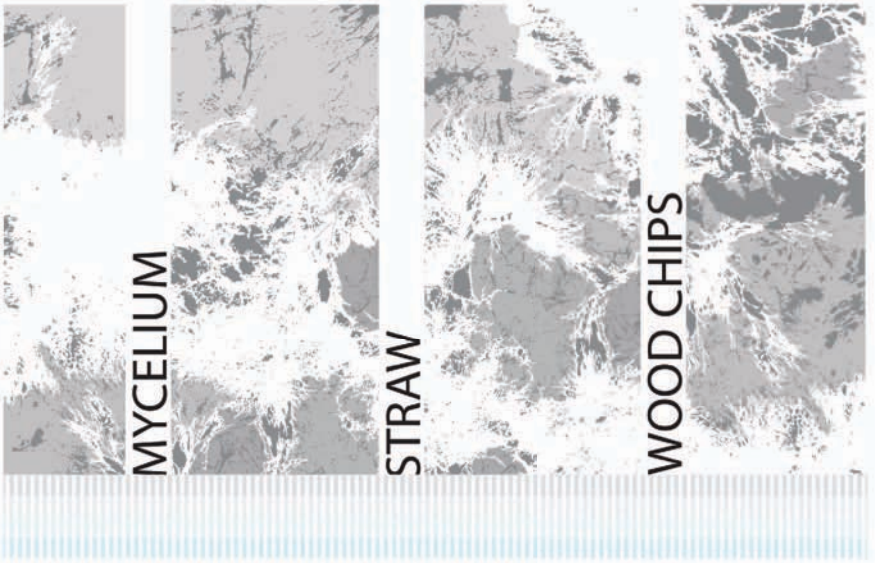
MYCELIUM FROM MUSHROOMS HAS THE UNIQUE ABILITY TO BREAKDOWN AND DETOXIFY A GREAT DEAL OF TOXIC INDUSTRIAL WASTE AND POLLUTION.

MYCELIUM IS ACTUALLY THE FRUIT OF A MUSHROOM. IN FORESTS, THE MYCELIA BREAKDOWN AND RECYCLE NITROGEN, CARBON AND PLANT AND ANIMAL DEBRIS; THEY TURN THE FORESTS` WASTE PRODUCTS INTO RICH SOIL. MUSHROOM MYCELIUM ALSO HAS THE UNIQUE ABILITY TO BREAK DOWN HYDROCARBONS - AND HYDROCARBONS ARE AT THE BASE OF MANY INDUSTRIAL POLLUTANTS. EVERYTHING FROM PESTICIDES TO DIOXINS HAVE A HYDROCARBON BASE.

MYCELIUM ABSORBS THE COMPOUNDS OF THE SOIL AND WATER AROUND IT. IT ACTS AS A FILTER TO REMOVE ANY USABLE MATERIALS, AND THEN IT RELEASES ENZYMES TO BREAK DOWN ANY REMAINING CONTAMINANTS.



GREYWATER - KITCHEN SINK

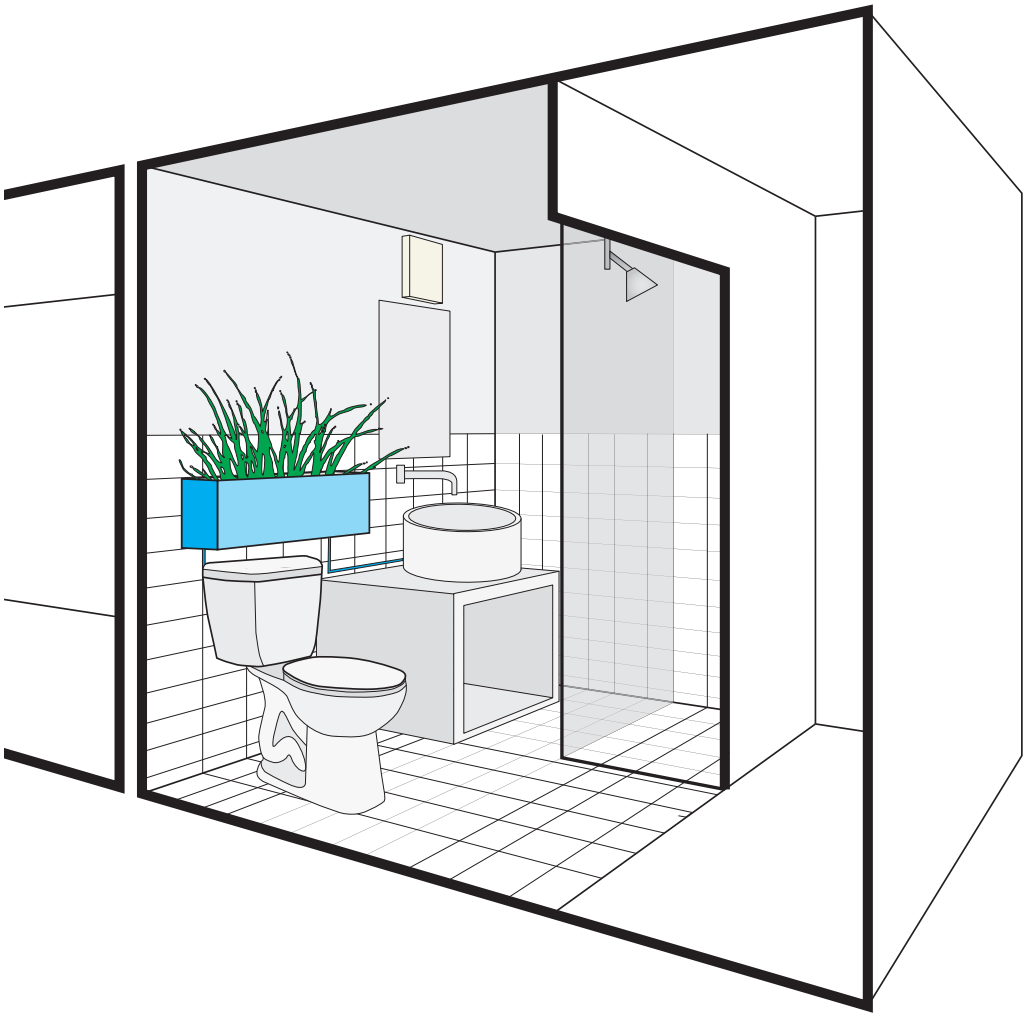


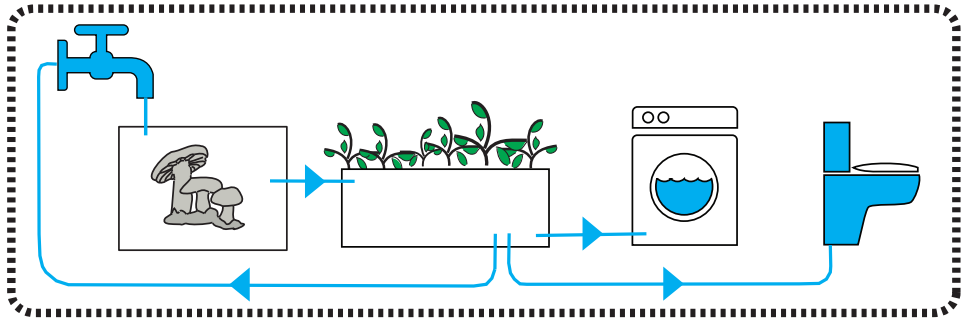
VEGETATION AS FILTER

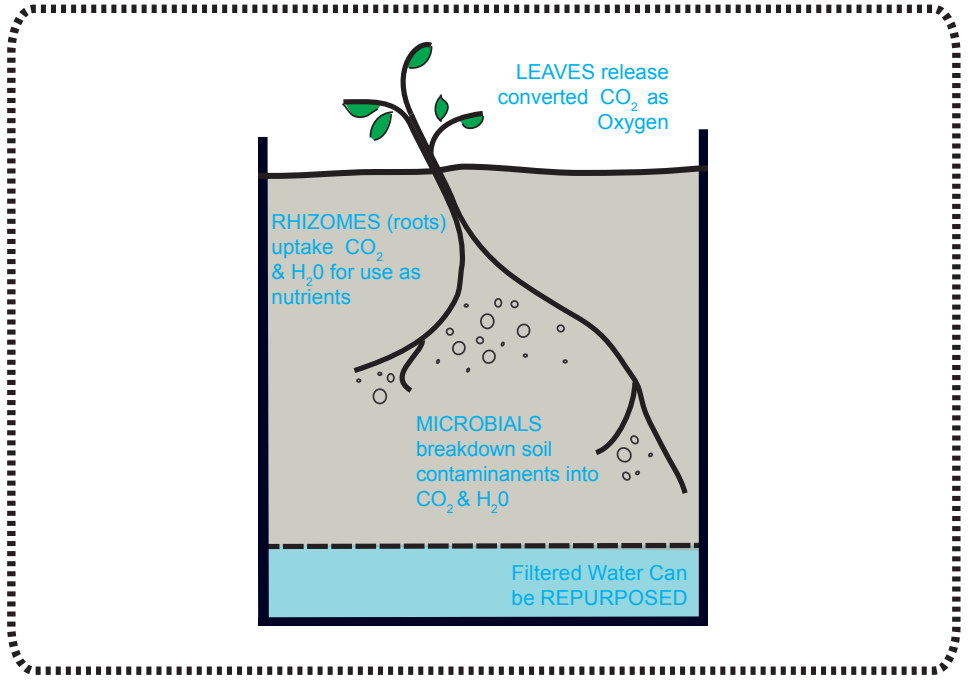
BIO-FILTRATION - Using Mushrooms & Plants to CLEAN grey water for REUSE

SOLUTION C - COLLECTION & REUSE

WATER WALLS







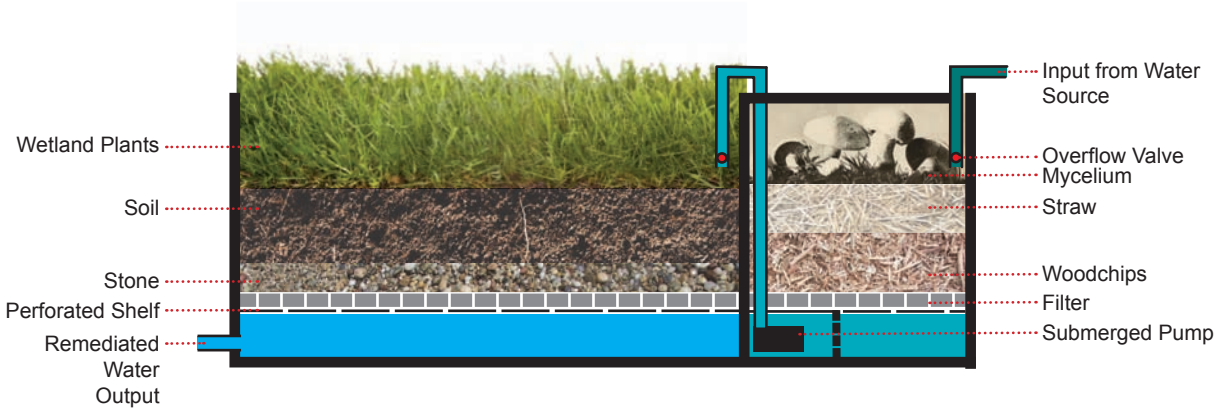
MYCO-FILTRATION & PHYTO-REMEDIATION

A combination of mushrooms and plants can break down toxins and heavy metals from sink water. In this scheme, wall mounted “remediation pods” are installed to collect used sink water to myco-filtration chambers where mushrooms initiate the first stage of cleaning. From here, water enters the planted chamber where the plants further clean the water before it is reused in various applications. In addition to water reuse, the plants also improve indoor air quality.

SOLUTION C - COLLECTION & REUSE

WATER WALLS

REMEDIATION POD (An Indoor Water Wall)



TESTING & DESIGN CONSIDERATIONS

- Increased Water Quality?
- Water Savings?
- Improved Air Quality?
- Ease of Maintenance/Cleaning?
- Best Plants, Mycelium & Microbes for context?
- Maximum Pod Size or Modular Size?
- Maximum Water Collection?
- Overflow Diversion?
- Energy Use?
- Social Response?
- Cost Analysis

LOCATION ASSESSMENT

LOCATION	FIXTURE TYPE	WATER USE/DAY (gallons)	CUBIC FEET OF WATER/DAY	POD SIZING minimum L x W x H	FEASIBLE FOR SPACE?
25 E 13th Street (ACADEMIC)	Lavatory Sink	70	9.5	6'4" x 1'6" x 4'	Only if valve in place to divert excess water for reduction in size
	Art Sink	?	?	?	Further Water Assessment Required of flow rates & use
300 W 20th Street (RESIDENCE)	Lavatory Sink	5.85	0.782	3' x 9" x 1'4"	YES
	Kitchen Sink	97.29	13	8'8" x 1'6" x 4'	Only if valve in place to divert excess water for reduction in size

NOTE: Pod Sizing based off 4 times the volume of daily water collection from the fixture as an initial estimate.

ANTICIPATED COSTS

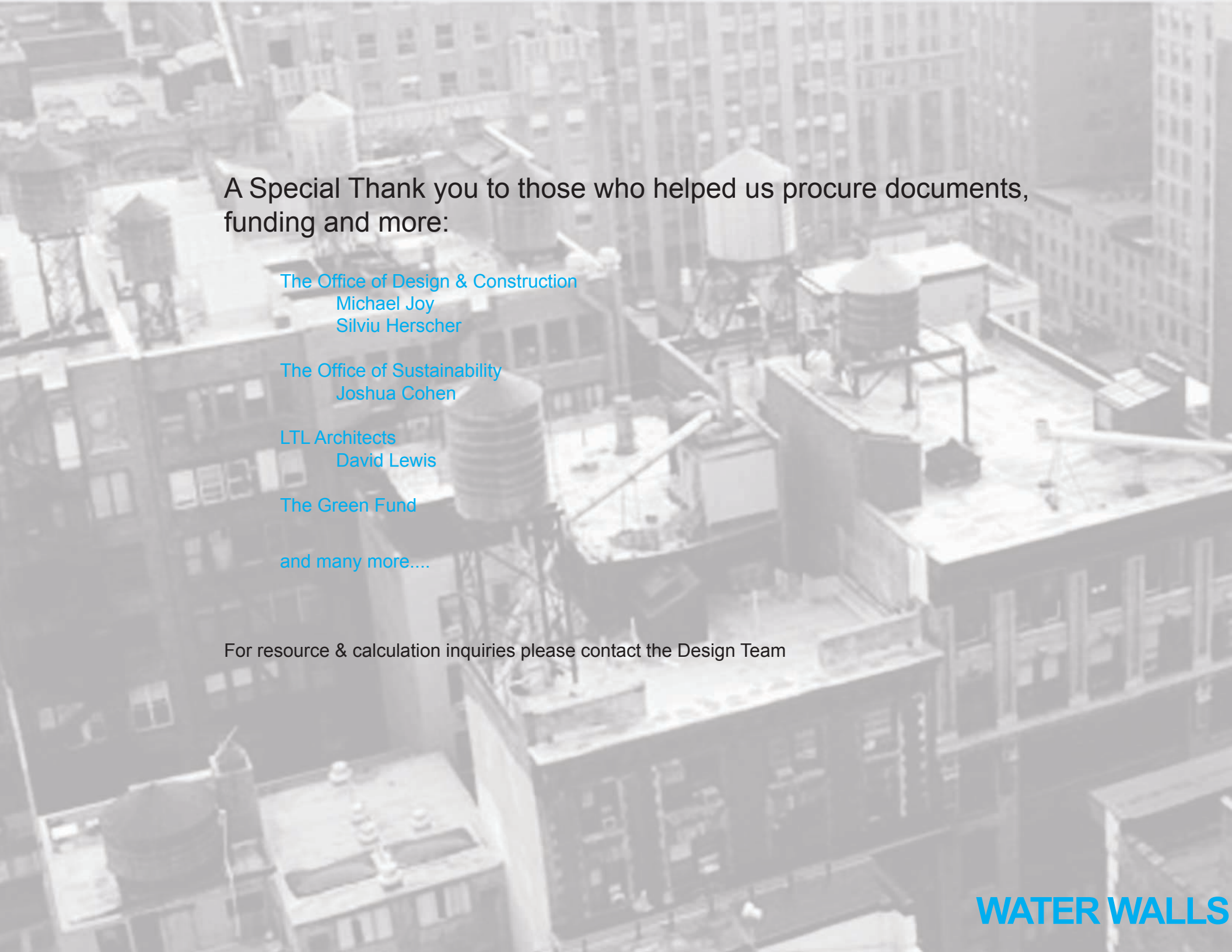
Water Testing Kits	$ 15.00
Pod Materials	$ 85.00
Plant Materials	$ 50.00
Construction & Installation	$100.00
Maintenance & Observation	$100.00
Additional Prototypes	$250.00
TOTAL	**$600.00**

FEASIBILITY

Depending upon study outcomes, larger pods may be mounted at central locations to gather water for reuse in more water demanding areas such as laundry facilities or even irrigation. Additionally, a pod could be a single module, sized for the smallest demands (as a single lavatory) that can then be interlocked with additional pods to service larger water needs such as laundry facilities. Further testing of prototypes is necessary to establish feasibility in the University context.

SOLUTION C - COLLECTION & REUSE

WATER WALLS



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and many more....

For resource & calculation inquiries please contact the Design Team

WATER WALLS